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The OUTLOOK FOR FROZEN FOODS

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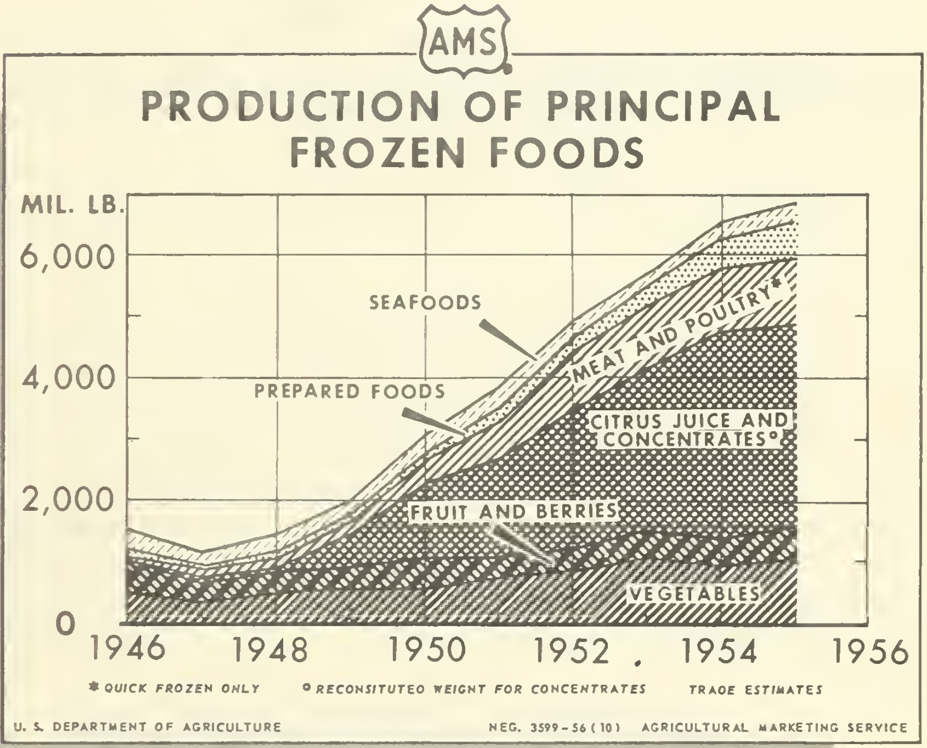

PRODUCTION OF PRINCIPAL FROZEN FOODS

* QUICK FROZEN ONLY ° RECONSITUTED WEIGHT FOR CONCENTRATES TRADE ESTIMATES

U. S. DEPARTMENT OF AGRICULTURE NEG. 3599-56 (10) AGRICULTURAL MARKETING SERVICE

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THE OUTLOOK FOR FROZEN FOODS

Production of the principal frozen foods in 1955 was about four and a half times the 1946 output. (See cover chart.) The frozen food package has become the principal outlet for several farm products although frozen foods are still only a small proportion of our total food supply. But the growth of the postwar frozen food industry did not result from a continued rapid increase in all frozen food products - some have not become large volume sellers.

Frozen (noncitrus) fruits and vegetables were the first groups to expand rapidly. In 1946 they accounted for about half the total production of frozen foods. Today they account for less than a fourth. Following a sharp decline in 1947, output of both generally has risen, but at a slower rate than some newer products.

Frozen orange juice concentrate began its rapid growth in 1949. Until recently total output of frozen juice concentrates (orange, lemonade, and grape) has increased faster than the total output of frozen foods.

Prepared frozen foods have entered a period of rapid growth. During 1955 production of these foods exceeded the 1954 total by 60 percent. Frozen meats may be just beginning their period of greatest growth.

Large increases in production and demand for frozen foods are likely in the years ahead. For many frozen foods now produced in small volume, a vast potential exists that could dwarf today's production. Though rate of development of these products cannot be predicted accurately, further increases in per capita use for many of the well established frozen foods can be expected, as well as increases that will result from population growth. Potential expansion is seen among the many families that now buy little or no frozen foods, as well as from anticipated rises in real income, further improvements in quality of frozen foods, and the growing popularity of convenience foods among homemakers. All these factors add up to more buyers for many frozen foods and larger purchases by present buyers.

The Outlook for Individual Product Groups

Frozen Vegetables

> Per capita consumption of frozen vegetables more than doubled between 1947 and 1955. Further increases may be expected in the years ahead, but at a less rapid rate. Increased emphasis on leafy green and yellow vegetables in our diet probably will add to demand for frozen vegetables. Frozen vegetables also may find a growing market through manufacturers' use in soups and other prepared foods.

The pack of frozen vegetables (not including frozen potato products) increased from 343 million pounds in 1947 to about 1,011 million pounds in 1955, 1/ and it increased in every year except 1954.

Frozen vegetables made inroads on some fresh and canned vegetables -- particularly fresh ones. Between 1947 and 1955, per capita consumption of frozen peas and spinach increased, but in fresh and canned forms it decreased (table 7). Consumption of frozen lima beans and snap beans rose but in fresh form it declined. In 1955, more lima beans, peas, and spinach were consumed in frozen than in fresh form, and consumption of frozen lima beans and frozen spinach was greater than that of the canned products.

Table 7.- Per capita civilian consumption of selected vegetables (fresh weight equivalent), United States, 1947 and 1955

Commodity	1947				1955			
	Frozen	Fresh	Canned	Total	Frozen	Fresh	Canned	Total
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Beans, lima 1/	0.8	0.6	0.5	1.9	1.6	0.3	0.7	2.6
Beans, snap	.3	4.5	2.0	6.8	.8	4.0	2.9	7.7
Broccoli	.1	.9	---	1.0	.7	.9	---	1.6
Corn	1.0	7.6	14.6	23.2	2.4	8.5	13.3	24.2
Peas 1/	2.3	1.1	9.7	13.1	3.7	.4	8.0	12.1
Spinach	.4	1.9	1.0	3.3	1.1	.6	.8	2.5
Total	4.9	16.6	27.8	49.3	10.3	14.7	25.7	50.7

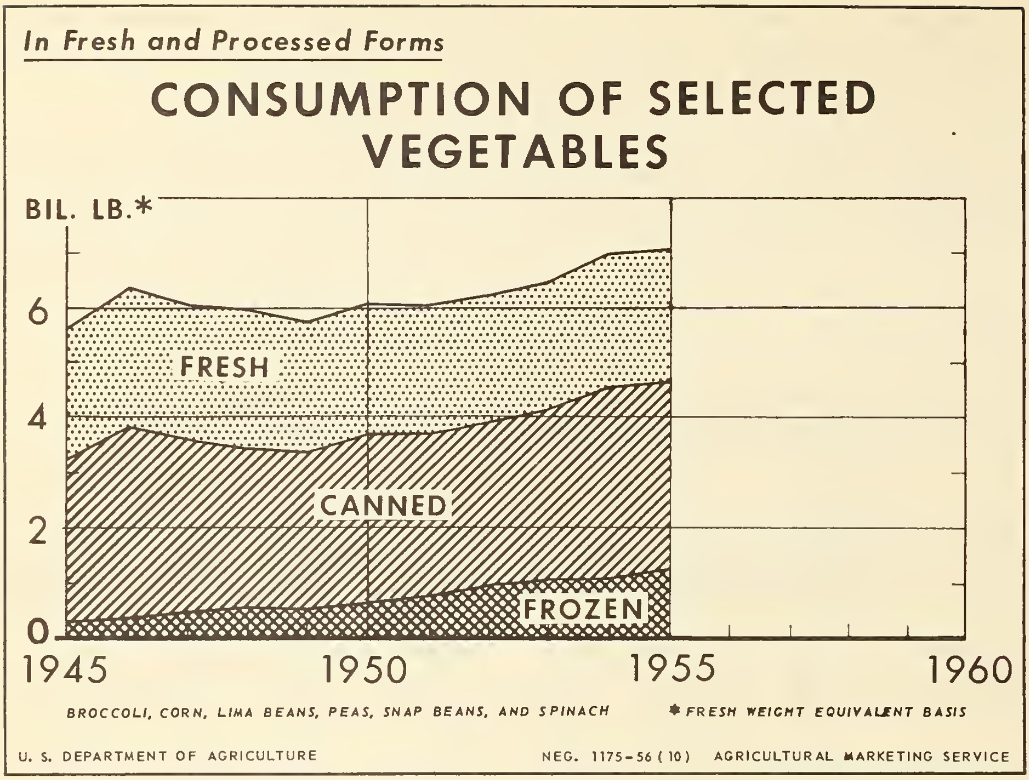
1/ Shelled weight.

Six frozen vegetables accounted for about three-fourths of the frozen vegetable pack (not including potato products) in 1955. Listed in order (of finished product weight) these were: Peas, snap beans, lima beans, spinach, broccoli, and corn. The combined consumption of these six vegetables in frozen form increased 930 million pounds (equivalent fresh weight) from 1947 to 1955, compared with increases of 460 million pounds for the canned products and 20 million pounds for the fresh products (fig. 1).

In recent years, packers have put about two-thirds of the frozen vegetables in retail-size containers (holding 1 pound or less). Between 1947 and 1951, the proportion in these small containers increased, but since 1951 it has decreased slightly. Frozen vegetables in retail-size containers are sold to consumers mainly through retail stores. The one-third that packers put in larger containers is sold mainly to restaurants and other institutional users and processors of soups and prepared foods.

As a result of a rise in incomes and a growing demand for convenience foods in the years ahead, sales of soups and other prepared foods may increase faster than the population. Manufacturers use frozen vegetables to a greater extent in making these products than do housewives.

1/ Frozen potato products, which are cooked before freezing, are not included in these totals but are included in totals for frozen prepared foods.



In Fresh and Processed Forms

CONSUMPTION OF SELECTED VEGETABLES

BROCCOLI, CORN, LIMA BEANS, PEAS, SNAP BEANS, AND SPINACH

* FRESH WEIGHT EQUIVALENT BASIS

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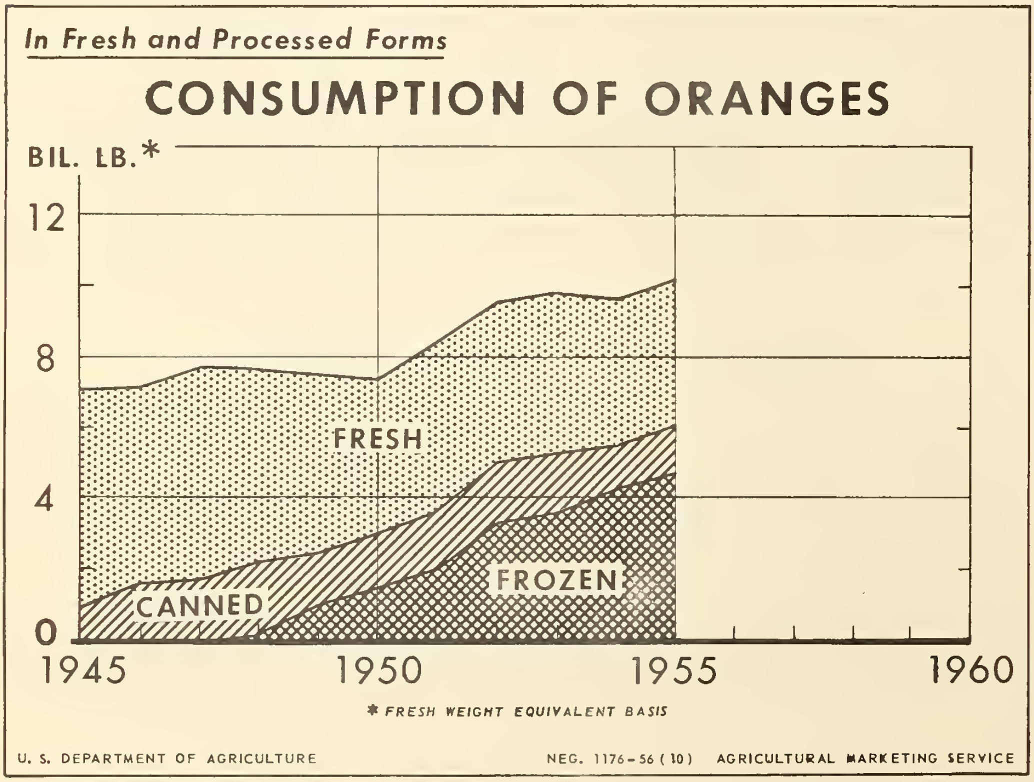
Figure 1



In Fresh and Processed Forms

CONSUMPTION OF ORANGES

* FRESH WEIGHT EQUIVALENT BASIS

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Figure 2

Frozen Deciduous Fruits and Berries

> Some increases are in prospect, but no rapid rate of growth for any of these products except strawberries is expected in the immediate future. The principal market for most of these products is to manufacturers of preserves, pies, and ice cream.

The production of frozen noncitrus fruits has fluctuated rather widely since World War II. Wartime expansion and expectations of large postwar markets caused a rapid increase in the pack in 1944-46. Many packers were inexperienced and produced poor quality products. Demand was not large enough to absorb the large output at profitable prices, and storage space and other marketing facilities were inadequate. Packers reduced output from about 519 million pounds in 1946 to 345 million pounds in 1947. It was not until 1953 that production was again as large as in 1946. In 1955, the pack amounted to about 660 million pounds.

Strawberries account for about half the growth in total pack since 1947. The strawberry pack increased from 109 million pounds in 1947 to about 273 million pounds in 1955; it made up two-fifths of the total pack of deciduous fruits and berries in 1955. More strawberries are now used for freezing than are sold fresh.

Packs of apricots, peaches, and several other fruits have never been as large as they were in 1946. Freezers take a large part of the sour cherry crop but only a small part of the production of apples, apricots, peaches, and other tree fruits.

Food manufacturers use a large part of the pack of frozen fruits and berries. Two-thirds of the pack goes into containers that hold more than 10 pounds. Food manufacturers buy most of these large packages. In 1955, all of the apricots, 94 percent of the apples, and 97 percent of the cherries were packed in these large containers.

Preserve manufacturers, pie bakers, and ice cream makers, the three major users of frozen fruits (including berries) bought about 600 million pounds of fresh, canned, and frozen fruit in 1953, the latest year for which data are available. Almost 80 percent of the fruit used by the ice cream industry was in frozen form. Manufacturers of jams, preserves, and jellies bought about 46 percent of their fruit in frozen form. Wholesale, multi-unit retail, and door-to-door distributing bakers obtained about 42 percent in that form.

The demand for frozen fruits and berries in the years ahead will be closely linked with the demand for the products of these food manufacturers. Commercially produced preserves, jams, and jellies; ice cream and other frozen desserts; and pies and pastries are convenience products. Increases in income and the growing demand for convenience foods should strengthen the demand for the commercially produced products by increasing consumption and by transferring more of the production of these foods from homes to processing plants. Avoidance of high calorie foods by a growing number of consumers would have the opposite effect. All of these foods have high calorie counts. Also, people generally eat preserves, jams, and jellies with bread and rolls, and the per capita consumption of these products has been declining.

Food manufacturers in the future may buy more frozen fruit and less fresh and canned fruit. Whether this happens will depend to a large extent upon the quality and costs of frozen fruits relative to the competing products.

The third of the frozen fruit packed in containers weighing 10 pounds or less is sold mainly to restaurants and other eating places and to consumers through retail stores. Strawberries account for the major part of these sales. In 1955, 46 percent of the strawberry pack and 45 percent of the red raspberries were in containers weighing 20 ounces or less. More than a third of the peaches was packed in containers weighing 10 pounds or less -- about one-fifth in those weighing 20 ounces or less.

Frozen Citrus Juice Concentrates

> Frozen orange juice concentrate in recent years accounted for much of the growth in the frozen food industry. Though this product may be past its peak rate of growth, the proportion of the orange crop used for frozen concentrated juice -- about 40 percent in 1954-55 -- is likely to continue to increase. Frozen lemon juice and lemonade concentrates are becoming large volume outlets for the lemon crop.

Rapid expansion in production of frozen concentrated citrus juices has been an outstanding postwar development in frozen food marketing. The frozen orange juice concentrate pack has grown to more than 70 million gallons during a single decade. By the 1954-55 season, this outlet accounted for about 40 percent of all oranges produced in the United States. About 4.8 billion pounds of oranges (fresh weight) were consumed in frozen form in 1955. This was 800 million pounds more than the quantity consumed in fresh form (fig. 2).

The large increase in household purchases of frozen concentrated orange juice during the last 5 years or more has been associated with several growth factors. The number of grocery stores handling the product regularly has increased, so it is now available to practically all consumers. About half of the Nation's families bought this product at least once during a 6-month period in 1955, compared with about a third during a similar period in 1950. The average purchase by families buying the product more than doubled from 1950 to 1955. This accounted for a larger part of the rise in total household purchases than the increase in number of families buying the product. In 1950, the largest purchases were made by higher income families, by families living in urban areas, and by families living in the Northeast region. Despite the general increase in overall purchases by 1955, the same relationships to income, urbanization, and residence still existed. 2/

The production of oranges has been increasing rapidly in recent years and further increases are in prospect. Many of the trees now standing have not reached the age of maximum yield, and many young groves have not begun to bear fruit in significant quantities.

Frozen lemon products were virtually unknown a decade ago but by the 1954-55 season about 10 million gallons of frozen lemon juice and lemonade concentrates were packed. This volume required around 27 percent of the total lemon crop during that season. More than 2 pounds of lemons, fresh weight, were consumed per capita in frozen form. Smaller quantities of other frozen citrus juices and juice concentrates, including blends, were frozen during the last decade.

Frozen Meats 3/

> Frozen meats at present constitute a small part of the total frozen food output, and of total meat production. In the immediate future various types now being developed and marketed may offer the largest potential growth to the frozen food industry.

The production of quick frozen red meats has increased rapidly in recent years. Output reached 250 million pounds in 1955, according to an estimate published by a trade journal. 4/ However, this was only a little more than 1 percent of the red meat (equivalent retail weight) marketed in that year. Some industry groups expect that a much larger proportion will be marketed in frozen form by 1960. The estimate of the quantity frozen in 1955 does not include meat that locker plants, freezer provisioners, and supermarkets froze and sold directly to consumers for storage in rented frozen food lockers or home freezers.

2/ Data in this paragraph were taken from the following reports: Fruits and Juices, Availability in Retail Stores, February 1956, CPFJ-24, Agr. Market. Serv., U. S. Dept. Agr., Apr. 1956; Consumer Purchases of Fruits and Juices by Family Characteristics, April-September 1955, CPFJ-20, Agr. Market. Serv., U. S. Dept. Agr. Consumer Buying Practice for Selected Fresh Fruits, Canned and Frozen Juices, and Dried Fruits, Related to Family Characteristics, Region, and City Size, April-September 1950, Bur. Agr. Econ.-Prod. Market. Adm., Aug. 1951.

3/ This section was based mainly on Survey of Current Distribution Practices for Prepackaged Frozen Meat by James S. Toothman, Market. Res. Rept. 137, Oct. 1956.

4/ Frozen Food Fact Book and Directory, 1956, National Frozen Food Distributors Association, New York.

Portion-Control Meats.- Some national, regional, and local meat packing companies and some institutional meat packers and jobbers freeze and package uniform portions of solid meats, such as steaks and chops, for sale to restaurants and institutions. These portion-control meats are a major part of the frozen meat pack. Restaurants and institutions buy them to reduce variations in meat portions and costs.

Specialty Frozen Meats.- Many specialty frozen meat products, such as chop steaks, cutlets, choppettes, and various ground meat products are sold to restaurants and institutions and in retail stores. These products are made from the lower grades and less desirable cuts of meat. A relatively large part of their value is added by grinding, chipping, portion molding, cubing, breading, and other processing.

About 100 firms process, freeze, and package uncooked specialty meats as their principal products. These firms are located throughout the country, usually in or near large cities. Most of them serve only local or regional markets. Restaurants and institutions use specialty items widely because they are convenient to store, easy to prepare, and uniform in size and weight. For that reason some institutional meat wholesalers or jobbers produce and distribute them. National and local packers also produce frozen specialty meats.

Retail Cuts.- A few packers, specialty meat processors, and wholesalers or jobbers sell frozen steaks, roasts, and chops. Some of these firms freeze and prepackage conventional retail cuts similar to the fresh cuts found in self-service cases of retail stores. Others sell fully trimmed, boneless, waste free cuts.

During 1955, a national meat packing company began a test marketing program for a line of about 30 packaged, full-trim frozen meat cuts. The company distributes these frozen cuts to retail stores through its branch houses. The retail stores display the frozen cuts adjacent to nonfrozen meat in self-service cases. This is the first national packer in recent years to market a line of ready-to-cook frozen solid meat cuts in retail stores. Also in 1955, a chain grocery store company began supplying prepackaged, frozen meats to its retail outlets from a central processing plant. Results of both these marketing innovations have been regarded as satisfactory so far.

Recently another national packing company introduced a line of frozen steaks and other frozen retail cuts of red meats in retail stores in Cleveland. The company planned to open up markets in other cities.

Advantages in Selling Frozen Meat.- The number of retail stores that sell meat entirely by self service has increased rapidly in recent years. Most of these stores cut and package steaks, chops, and roasts on their premises. Central plant cutting and packaging apparently would have several cost advantages. But because of difficulty in preventing quality deterioration most attempts at marketing fresh meat cut and packaged in central plants have been unsuccessful. Experience has shown that quality can be preserved satisfactorily by freezing. The advantages of processing and packaging in a central plant are:

1. The retail store, restaurant, or other establishment is not required to have a butcher and meat-cutting facilities.

2. Some excess fat and bone are removed at the central plant. These cuts weigh about 40 percent less than the carcass from which they are taken. The reduction in weight and bulk saves on storage and transportation costs. More value can be realized from the fat and bone at the central plant than at the retail establishment. These advantages are greatest when fully trimmed and boneless cuts are fabricated and frozen at the packinghouse.

3. Losses from shrinkage, down grading, and spoilage of fresh meat during distribution are eliminated.

4. The productivity of labor may be increased. Any improvements in labor productivity in cutting and packaging meat achieved so far by transferring these operations to central plants have resulted mainly from greater labor specialization and a more even flow of work. Fabrication of retail cuts and portion control meats is still largely a manual operation. Packaging has been done with materials and machinery designed for other frozen foods. However, greater use of specially designed meat fabricating and packaging machinery is anticipated.

The cost advantages of cutting and packaging meat in a central plant and distributing it in frozen form to retail outlets are offset in part, at least, by the cost of freezing and higher refrigeration and packaging costs.

The Outlook for Frozen Meat.- Some people connected with meat marketing expect that as much as 20 percent of the volume of steaks, chops, and roasts sold in retail stores will be in frozen form by 1960. Several large food store chains are now carrying frozen retail cuts and others are interested in the possibilities of this form of meat marketing. At least one meat packing company executive foresees the possibility of devising new and better cutting methods when cutting is done at the packinghouse. The advantage of cutting, boning, packaging, and freezing at the slaughtering plant appears to be great enough to bring about a substantial increase eventually in the volume of frozen retail cuts.

Considerable promotional work may be required before many consumers realize they can afford to pay higher prices per pound for fully trimmed and boned meat than for the conventional cuts.

Consumer preference for prepackaged frozen cuts will depend to a large extent upon whether uniform quality is maintained.

Prospects for growth in the output of frozen portion control meats appear to be good. Expected increases in the population, in per capita consumption of meat, and the proportion of meals eaten away from home should strengthen the demand for these products. Specialty meats may benefit from the growing demand for convenience products.

Frozen Poultry

> Commercial poultry processing plants in recent years have frozen about 30 percent of the poultry they slaughtered. The proportion frozen is largest for turkeys, ducks, geese, and mature chickens. Commercial plants freeze only about 12 percent of the broilers and other young chickens they slaughter. Most of these are cut up before freezing. Further increases in the proportion of poultry marketed in frozen form may be small, as several developments have reduced the need for freezing.

Freezing has become an important method of preserving poultry. The Agricultural Marketing Service estimates that in recent years about 30 percent of all poultry slaughtered in commercial poultry processing plants [5] has been frozen. In 1955 the total slaughter approximated 4,287 million pounds (table 8).

Table 8.- Volume of poultry slaughtered in commercial plants and percentage frozen, 1955

Item	Quantity slaughtered	Quantity frozen as a percentage of total slaughter [1]
	Million pounds	Percent
Broilers and other young chickens ..	2,973	12
Mature chickens	527	45
Turkeys	743	82
Ducks and geese	44	66
All poultry	4,287	29

[1] Does not include quantities frozen by handlers after poultry leaves the slaughtering plant.

These estimates cover all types of frozen poultry. They include: (1) Frozen whole turkeys or mature hens, individually wrapped or packed, several to a box for institutional use; (2) broilers boxed as cut-up birds ready to fry or as boxes of specified parts; (3) whole birds frozen for preservation while in transit and retailed as fresh, iced poultry; and (4) other packs.

The following estimates of the production of quick frozen poultry from the 1956 Frozen Food Fact Book and Directory reflect the rapid increases during the last decade, although they are not directly comparable with the recent AMS estimates:

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[5] Plants slaughtering at least 30,000 pounds live weight per week.

Year	Million pounds	Year	Million pounds
1946	170	1951	582
1947	130	1952	800
1948	150	1953	850
1949	224	1954	900
1950	411	1955	875

Frozen Whole Birds.- Poultry intended for roasting, such as turkey, fowl, or duck, are frozen as ready-to-cook whole birds. Giblets are included, and some specialty firms provide dressing or stuffing for the homemaker's convenience. These birds are usually wrapped individually and may be displayed in an individual carton. Occasionally fryers are frozen whole for preservation during transit. But these birds are usually allowed to thaw while on display and the homemakers buy them as a fresh, iced product.

Frozen Cut-Up Poultry.- Most of the broilers or fryers are cut up before freezing. The package includes each of the component parts of the original bird and all are ready to cook. The homemaker can begin cooking before the meat is thoroughly thawed.

Frozen Poultry Parts.- In a number of slaughtering plants, broilers are cut up and the parts packed and frozen separately. In this way the homemaker can choose those parts she prefers. They are packed for sale in consumer cartons or in larger boxes for institutional use.

Prepared Foods.- Some of the newest of frozen poultry products are precooked and ready-to-eat. These include chicken and turkey potpies, dinners, and precooked whole broilers. They have the advantage of great convenience for the homemaker.

Advantages of Freezing.- Processors of turkeys rely heavily on freezing as a method of preservation. Freezing is quite advantageous for turkey slaughterers since it permits the slaughtering season to begin well in advance of the marketing season. This distributes the load on processing facilities and crews over many weeks rather than concentrating it in the short Thanksgiving-Christmas marketing period. It permits the grower to market his birds when they are in optimum condition and gives the homemaker a product which she can hold until needed.

Processors of mature fowl find that freezing offers some of the same advantages to them as to turkey processors. In addition, it permits them to lengthen the marketing season so that fowl are more evenly available throughout the year rather than mainly during the fall and winter.

The freezing of broilers is limited principally to a few firms with national reputations for their frozen packs. Freezing facilitates national distribution and orderly marketing, particularly in retail stores whose sales of poultry are small and infrequent. Some freezing also is done by slaughterers who wish to hold supplies for improved prices. Some birds are shipped partially frozen to prolong their shelf life.

The Outlook Frozen Poultry.- The freezing of poultry has reached a relatively high degree of use and popularity. Further increases in the proportion of poultry to be frozen may come, but a continuation of past trends is not necessarily assured. Among several recent developments in poultry production and marketing that tend to reduce the need for freezing are: (1) The fryer type turkey, providing birds on a year-round basis and reducing the need for freezing; (2) antibiotics, which lengthen the shelf life of fresh poultry; (3) highly integrated chain-store distribution, which facilitates the distribution of fresh iced poultry and reduces need for the frozen product; and (4) improvements in processing and transportation, which speed up the marketing process and reduce need for freezing.

Freezing is often used to convert poultry into storable form during periods of low prices. Such periods may result from sharp increases in production or seasonal decreases in demand. The future for this type of freezing operation, therefore, will depend upon the extent to which production can be kept in adjustment with demand, or upon whether it is cheaper to freeze than to make such adjustments.

The one area in which frozen poultry is likely to expand is that of prepared foods such as chicken dinners, turkey dinners, and other precooked poultry. It is not expected, however, that such products will absorb a major part of the poultry slaughter.

Frozen Concentrated Milk

> Frozen concentrated milk is not yet in commercial marketing channels although some use has been made of it by the Armed Forces. No large volume production is foreseen in the near future, but, because of the great volume of milk production, even a small percentage of it marketed in frozen concentrated form would significantly affect total frozen food output.

Frozen concentrated milk has not yet reached the general public, but the Army and Navy have bought small quantities for trial pruposes. In England and Denmark, frozen concentrated milk is produced commercially for use on shipboard.

Frozen concentrated milk is fresh whole milk from which part of the water -- usually two-thirds -- has been removed and the concentrate frozen. Mixed with two parts of water it makes whole milk of original composition. It retains its flavor for 2 to 3 months if stored at -10° F., and longer if held at a lower temperature, according to recent research by the Eastern Utilization Research Branch of the United States Department of Agriculture.

Though its keeping quality is satisfactory, available information indicates that under present shipping, packaging, and distributing methods the concentrate is a more costly product than fresh fluid milk. On one Navy contract, the cost of frozen concentrated milk equivalent to 1 quart of whole milk was 20.4 cents laid down in Norfolk, Virginia. The frozen product was made from raw milk costing $3.34 per 100 pounds. Another Navy contract specified 23.0 cents delivered at Bayonne, New Jersey. This frozen concentrated milk was packaged in quart paper containers and shipped in export boxes. The prices are based on large lot deliveries and are about the same as those one might expect for frozen concentrated milk shipped from dairy product manufacturing areas into eastern markets or made from surplus milk in a city market. These prices do not include any costs for distribution to stores or to consumers. They include a profit for the contracting firm.

No information is available as to the cost of distributing frozen concentrated milk. It is known that many frozen food distributors sell to institutions, stores, and other buyers at margins of about 15 percent of the wholesale selling price. Platform prices of 20.4 cents per quart of whole milk equivalent would approximate 61 cents per quart of frozen concentrated milk. Assuming a 15-percent margin, the prices of frozen milk delivered to stores would be approximately 72 cents per quart, or 24 cents per quart of milk equivalent.

The average percentage gross margin on purchase cost that stores take on milk has been reported as about 10 percent. On the basis of an average margin of 10 percent, the price consumers would pay for frozen concentrated milk would be about 26 cents per quart of milk equivalent. These estimated prices compare with an United States average price for fresh whole milk of about 23 cents per quart at stores. Processing and distribution costs might be lowered if large-scale sales developed.

Present indications are that if frozen concentrated milk were made available to the public it would be sold to consumers by retail stores and frozen food plans. Retail stores could be supplied by either dairy companies or frozen food distributors.

Even a small shift from fresh milk consumption to frozen milk would have a significant effect on the total tonnage of frozen food sold in this country. One percent of the fluid milk and cream consumption in the form of a three-to-one concentrate amounts to nearly 97,000 tons of frozen concentrated milk per year, roughly 3 percent of the total frozen food tonnage produced in 1955.

Any great increase in retail sales of frozen concentrated milk appears unlikely unless new and lower cost methods of processing and distributing are found. Its present opportunities appear greatest in markets in which prices are substantially above the national average. Frozen concentrated milk appears to have possibilities for use on shipboard where subzero storage space is available and a premium is placed on compactness and keeping quality.

Frozen concentrated milk would be in competition with unfrozen milk concentrate, which cannot be kept as long as the frozen product but requires less expensive refrigeration.

Frozen concentrated milk would have little or no advantage over instant dry whole milk or sterile concentrated milk should these products be developed in satisfactory form.

Prepared Frozen Foods

> This group of foods is currently the fastest growing part of the industry. They offer the housewife more built-in maid services than do most frozen foods. The growing acceptance of convenience products, stimulated by rising real incomes and increased urbanization, is likely to bring more different products into the market and larger sales for this group.

Prepared frozen foods include those that have received one or more preparatory operations customarily performed in the home. Most of these items have no commercial counterpart in fresh or canned form.

There are more than 200 prepared frozen food items on the market today. They constitute one of the most rapidly growing segments of the frozen food industry. During 1955 the production of prepared frozen foods exceeded 500 million pounds. This was 60 percent more than the 1954 total.

Frozen potato products was the largest single product category in 1955. Four product groups -- french fried potatoes, poultry and meat potpies, fish sticks, and dessert pies accounted for about two-thirds of the total output.

The bulk of prepared frozen foods is marketed through retail outlets. However, during 1955, about 85 million pounds moved into institutional outlets. The production of frozen french fried potatoes for restaurant outlets is expanding rapidly. Portion-controlled meats and poultry products, dessert pies, and other bakery products also are reported to be packed for the institutional trade.

The use of frozen prepared dinners is increasing. Some of the largest frozen food packers now are selling prepared dinners. The growing demand for convenience foods is expected to broaden the market for these products among household consumers. Other markets probably will continue to expand. Already airlines buy frozen dinners to serve their passengers, and many small restaurants in the future may find it profitable to serve them. They could offer a much wider selection, reduce waste, and substitute a relatively low paid worker for a higher paid chef.

An increasing number of well known restaurants are producing frozen prepared foods and selling them for off-premise consumption. Often these foods are produced when workers are not otherwise fully employed. Restaurants generally produce foods for which they have gained a favorable reputation.

Chinese, Italian, Mexican, and Kosher dinners and individual foods in frozen form have gained in popularity. These foods appeal to consumers' desire for variety. Many persons who have acquired a taste for these foods by eating them in "foreign" restaurants or when in foreign countries now can have them at home.

The maintenance of quality appears to be particularly important to the future growth of prepared frozen foods. Quality is mentioned frequently by the processors as one of the major problems facing the industry. There are no standards of quality for the finished products. Brand labels are the only guide consumers have in seeking quality products.

Increases in production should continue so long as quality products are made available at competitive prices with the homemade products. The convenience and variety factors afforded by these foods make them particularly desired by the homemaker wishing to shift some of her kitchen burdens to the factory.

Factors Affecting Consumer Demand for Frozen Foods

> A generally favorable outlook for greater consumption of most frozen foods is indicated by several factors. One of these is, of course, more stomachs to fill. And for some frozen foods this may be more important than expanding per capita consumption. Many families seldom or never buy frozen foods. Higher incomes, more low-temperature storage space in the home, more frozen food cabinets in grocery stores, and continued improvement in quality may cause a larger proportion of families to become regular pruchasers of frozen foods. More women employed away from home and more families in urban areas would likely boost the market for convenience foods. More meals eaten away from home also would increase frozen food use as restaurants and other food purveyors are large users of frozen foods.

More Consumers

Population of the United States on September 1, 1956, was estimated at 168.6 million persons. Recently it has increased about 3 million each year. By 1965 it will be at least 186 million and may be 193 million, according to the most recent projections of the Bureau of the Census. Projections to 1975 range from 207 to 228 million (fig. 3). Thus, the growth in population alone probably will increase the aggregate demand between 20 and 35 percent by 1975. These estimates of the future size of the population vary because of different assumptions as to future birth rates, death rates, and net immigration.

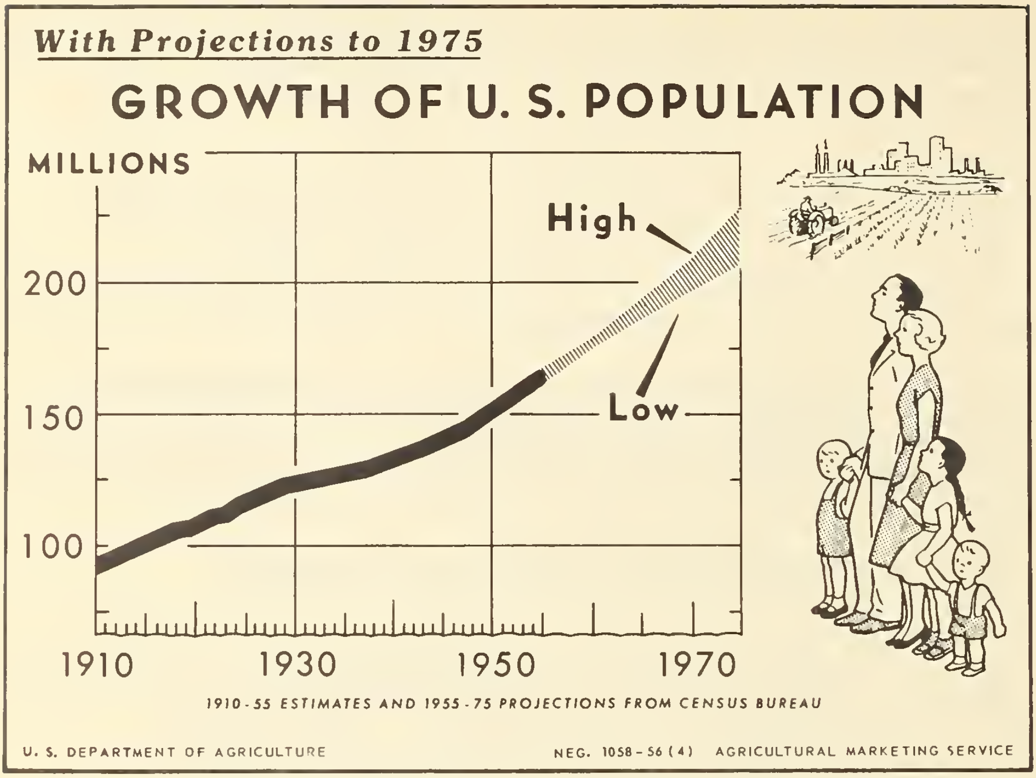

Figure 3

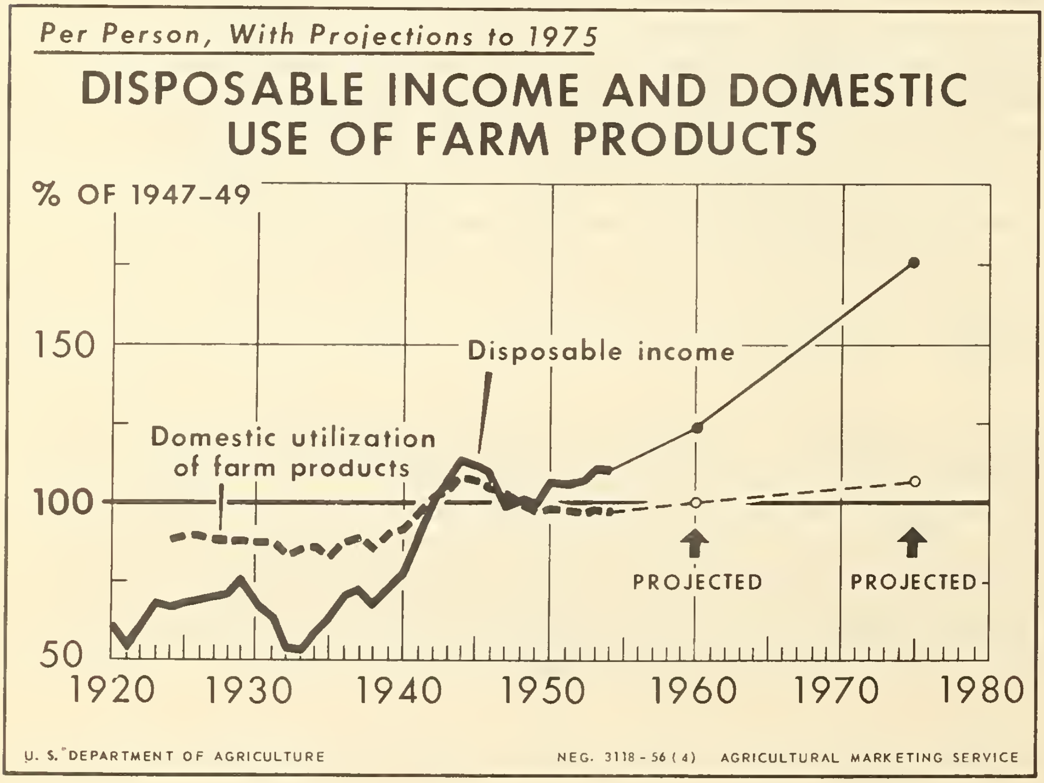

Figure 4

Continuation of the movement of people from farms to nonfarm homes will affect the demand for frozen foods. The number of persons living on farms declined from 25 million in 1950 to 22 million in 1956. Farm families generally produce more of the fruits and vegetables, poultry, meats, and other products they consume than do nonfarm families. They buy less frozen food than do nonfarm families. This is indicated by a nationwide survey of household food consumption that the United States Department of Agriculture conducted in the spring of 1955.

The Pacific Coast and Mountain States will have a larger proportion of the total population in the years ahead if present population trends continue. Also, the proportions in the 10 to 25 year and 50 year and over age groups will be larger.

Rising Consumer Incomes

Real disposable income per person has increased nearly 60 percent since 1939 and may increase around 50 percent further from 1956 to 1975, provided relatively full employment exists at that date (fig. 4). 6/ Whether these higher incomes are realized depends mainly on output per man-hour continuing to increase by at least its long-term average rate of about 2.5 percent annually. Expectations of maintaining this rate seem reasonable, particularly in view of prospective developments in automation and rapid expansion in capital.

There are several reasons for expecting that the anticipated rise in consumer incomes will strengthen the demand for frozen foods. Families in the upper income groups buy more frozen foods than do lower income families. The Agricultural Marketing Service made a survey of purchases of 12 frozen foods in 1952 by more than 2,000 families living in urban areas throughout the United States. The proportion of families buying each of the frozen foods was larger among the families having incomes of more than $3,000 a year than among those with smaller incomes. 7/ Other surveys of food consumption and expenditures conducted by the Department of Agriculture in recent years indicate that the proportion of families buying frozen foods is larger in the higher income groups than in the lower income groups and that purchases per person are larger among higher income families.

Many studies of food consumption patterns in relation to income indicate that when consumers' incomes rise they buy larger quantities (in fresh or processed form) of citrus fruits and most deciduous fruits, leafy, green, and yellow vegetables, red meats, and poultry. Recent projections of long-range demand and supply show substantial increases by 1975 in per capita consumption of these products. 8/ Larger proportions of these products are likely to be sold in frozen form in the years ahead.

6/ Daly, Rex F., "The Long-Run Demand for Farm Products," Agricultural Economics Research, VIII. 3:73-91, July 1956.

7/ Bitting, H. W., Purchases of Frozen and Canned Foods by Urban Families as Related to Home Refrigeration Facilities, U. S. Dept. Agr. Market. Res. Rept. 60, Feb. 1954.

8/ See reference cited in footnote 6.

People probably will eat more meals in restaurants if their incomes increase. Restaurants now buy relatively more food in frozen form than do household consumers. If this relationship continues, an increase in "eating out" would bring a net increase in sales of frozen foods.

The Growing Market for Convenience Foods

The transfer of tasks from the kitchen to the marketing system has been going on for years. Marketing of products in frozen form has enabled the marketing system to provide more services with the food products consumers buy. Frozen foods save time and effort in shopping and in the preparation of meals. Many need only to be warmed before serving. Rising incomes and the increase in the number of women working outside the home have increased the demand for these "convenience" products. In 1955, about 29 percent of the married women in this country were working outside the home compared with 21 percent in 1947.

Competition with Food Products Marketed in Other Forms

Efforts are being made to improve the quality and reduce the costs of marketing food products in fresh, canned, and dehydrated forms. Progress in marketing food products in these competing forms will affect the demand for frozen foods.

Prepackaging of cleaned, trimmed vegetables is making shopping more convenient and preparation of the products in the kitchen easier. Research workers are studying methods of loading and refrigerating fruits and vegetables for shipment so as to reduce quality deterioration. Retailers are learning how to display fresh produce more attractively.

Canners are experimenting with new methods to reduce or eliminate the overcooking effects sometimes resulting from the heat required to sterilize a can of food. They have been able to sterilize some products without overcooking by agitating the product in the can during heat sterilization. The food in the can is agitated by rotating the can either on its longitudinal axis or end-over-end. Asceptic canning has been used successfully with some products. The product is sterilized before being put in the can by heating at high temperature for a short time. This process has been called "flash sterilization." The sterilized product is rapidly cooled and run into presterilized containers, which are closed with presterilized lids. Filling and closing are performed in enclosures in which an atmosphere of superheated steam or other sterile gas is maintained. Besides improving quality, these processes are expected to reduce costs because of their continuous nature. Thus far these new processes have been used commercially in canning only a few products.

Postwar increases in transportation costs have stimulated efforts to develop more acceptable dehydrated products. The reduction in weight resulting from the removal of water from these products gives them a distinct advantage with respect to transportation costs.

Radiation Preservation.- Research workers are experimenting with a new method of preserving food -- radiation sterilization. Atomic energy is used to destroy the microorganisms that cause decomposition in food products. With only a slight rise in the temperature of the sterilized product, microorganisms can be destroyed and enzymes inactivated. But the large applications of radiation required cause objectionable changes in flavor, color, odor, and texture of many foods. Further experimentation may show how these undesirable changes can be prevented. Before this method is used commercially, it must be determined that irradiated foods are not harmful. So far, no harmful effects have been revealed, but further tests must be made before the Food and Drug Administration will approve irradiated food for human consumption. The method may, of course, be technically feasible, but its cost may prevent extensive use. Estimates vary widely as to how soon radiation sterilization will be used commercially and as to the extent to which it will be used.

More Storage Space in Homes

Lack of refrigerated storage space in homes perhaps is a minor factor in limiting purchases of frozen foods. According to the 1950 Census, 80 percent of all dwelling units in this country, and 86 percent of those in urban areas, had mechanical refrigerators. It has been estimated that in January 1956, 94 percent of the homes in this country had refrigerators. 9/ Some refrigerators sold in recent years have compartments that hold from 50 to 75 pounds of frozen foods. Frozen foods can be kept for several days in the ice-making compartment of refrigerators that do not have frozen food compartments. In many of the older refrigerators the ice-making compartment holds only a few pounds. For families that shop only once a week, such a lack of storage space may limit purchases of frozen foods.

It is estimated that 8.2 million home freezers with a total storage space of 115.3 million cubic feet are in use in this country. 10/ About 1 million home freezer units were sold during 1955, according to sales data compiled by the National Electrical Manufacturers Association. Many of these home freezers are filled mainly with home frozen foods or food frozen at locker plants or by other custom freezers. This estimate of home freezer capacity does not include combination refrigerator-freezers that have a compartment in which 0° F. degrees temperature is maintained.

Large Potential Market Among Nonusers

Many families in this country rarely buy even the most widely used frozen foods. Various surveys have shown this to be true of families in

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9/ Statistical Abstract, 1956. Dept. of Commerce, p. 838.

10/ Quick Frozen Foods, Mar. 1956, p. 143.

both lower and upper income groups. Sometimes more of the increase in purchases of a frozen product has come from larger purchases by users than from an expansion in number of families buying the product. It may be easier to increase the total purchases for frozen foods in the future by increasing the proportion of families regularly buying them.

Developments that May Affect Future Trends

> The continued growth of the frozen food industry will require more processing plants, warehouse space, refrigerated transportation equipment, and retail-store cabinets. New products and improvement in quality of present products also will be part of this expansion. This growth in facilities and output will doubtless mean changes in the competitive structure of the industry and in the location of processing plants and other facilities. The present increase in the use of private label frozen foods over nationally advertised brands illustrates one of these changes. As a result, more firms are packing for private label. Several important mergers have occurred in recent years, some involving companies with widely diverse product lines. Entry of retail-store organizations into processing also affects the competitive structure of the industry. The rate of future development also is dependent upon relatively low prices of frozen foods compared with prices of competing foods. Various technological developments are aimed at reducing costs of processing and handling frozen foods.

Technological Progress

Quality Improvement.- To get and hold steady customers for frozen foods confidence in quality must be built up. Consumers cannot inspect frozen foods enclosed in cartons as they can fresh foods in the open. Federal grade labels sometimes appear on containers of strawberries, lima beans, and citrus juices to help consumers choose products, but in buying most frozen foods they have only their previous experience with the same brand of product to guide them. Disappointments in quality have stopped many consumers from becoming frequent buyers of frozen foods.

Several conditions appear favorable to future improvement in quality. The frozen food industry is relatively young. Processors, distributors, and retailers are gaining knowledge and experience needed to improve quality. Equipment for processing, storing, and handling frozen foods is being improved. Organizations of processors and dealers are aware of the need to improve quality and are interested in ways to secure quality control and maintenance.

Private organizations and State and Federal Government agencies are conducting research to learn more about how temperature and humidity affect quality, about changes in the product during freezing, and about other determinants of quality. Plant breeders are developing varieties of fruits and vegetables better adapted to freezing. Harvesting, freezing, packaging, and storing methods are being studied.

Efforts to cut costs have sometimes led to quality deterioration. This danger to quality appears to be greatest in the manufactures of prepared foods. Cheaper but inferior ingredients may be substituted for more costly ingredients that are essential in providing acceptable quality. Trade associations seem to be aware that poor quality in the products of some firms may damage the market for the products of all firms in the industry.

Development of New Products.- Much of the growth in the total output of frozen foods may come from marketing products in frozen form not now generally sold frozen. If some of the problems connected with marketing frozen meat are solved, its volume may soon be larger than that of frozen fruits and vegetables. Many processors are trying to find methods of freezing satisfactorily products not now marketed frozen. Nearly all perishables have been frozen on an experimental basis. Frozen cakes and pies are now in retail food store cabinets. Some believe that bakeries should sell more products, including bread, in frozen form. This would eliminate return of stale products by retailers. For several years some baking firms have frozen baked goods to preserve their freshness during storage but have thawed them before selling to consumers.

Dehydrofreezing.- Research workers of the United States Department of Agriculture and a few marketing firms are investigating the cost-saving possibilities of dehydrofreezing in marketing fruits and vegetables. The processor first dehydrates the product until its weight and volume are reduced approximately 50 percent and then freezes the dehydrated product to prevent deterioration. This process does not damage the quality of most of the fruits and vegetables so far tested. Partial dehydration does not produce the objectionable chnages often associated with products that are more completely dehydrated. The reduction in weight and volume would mean substantial savings in transportation, container, storage, and handling costs. But these savings would be at least partially offset by the cost of dehydrating the products.

Dehydrofreezing now appears to have its greatest possibilities in processing foods for bakeries, jam manufacturers, soup canners, and other food manufacturers. Restaurants and other institutional buyers also will provide a market if dehydrofrozen products prove to be cheaper than the conventionally frozen products and of equal or better quality.

Other Cost-Saving Possibilities.- Food freezing firms in recent years have made many technological changes with the expectation of reducing production costs. Many of these changes have been comparable to those made in the canning and other food processing industries. Among these are new methods and equipment for handling materials. Automatic fillers, blanchers, sorting and grading equipment, cutters, and choppers have been installed. Some changes have been made in equipment used only in frozen food plants. Equipment manufacturers have built automatic continuous packaging machines which feed, open, and close retail and small institutional sized cartons at the rate of 200 or more per minute. They make high speed automatic wrapping machines that can keep up with these filling machines. Automatic, continuous multiplate freezers are used in some plants. Frozen food packers now are testing automatic casing equipment. Many plants now do not have some of this modern equipment or the most efficient plant layout. Improvements in equipment are likely in future years. Considerable hand labor still is involved in preparing and packing many frozen foods. Equipment manufacturers and packers probably will develop machines to do more and more of this work. Several private and public agencies are trying to invent better machines and to find better techniques for processing and distributing frozen foods. 11/

More Outlets for Frozen Foods

In Retail Stores.- The increase in number of retail stores carrying frozen foods has widened the market for these products. Many retail stores were slow to install refrigerated cabinets for displaying frozen foods because of their cost. Floor space given to frozen foods often had to be taken from display space for other products. Until frozen concentrated orange juice came on the market, all frozen food items generally moved rather slowly.

Many retail food stores have installed frozen food cabinets in recent years -- some for the first time and others to expand cabinet capacity. According to a survey conducted by a private marketing research firm, more than two-thirds of the grocery stores had frozen food cabinets in 1955. 12/ These stores accounted for more than 90 percent of the grocery-store sales. The South is the only region in which stores that had frozen food cabinets accounted for less than 90 percent of total grocery sales. The survey further indicated that grocery stores in communities with less than 10,000 population frequently had frozen food cabinets.

A larger proportion of the grocery stores probably will have frozen food cabinets in the future. Among small stores, closings have exceeded openings in recent years. Grocery stores that do not have frozen food cabinets are generally small.

Many stores that sell frozen foods do not have enough cabinet space to permit them to carry a full line. Stores frequently stock only the fastest moving items. Many stores carry only one brand of an item even though several well known brands are in demand.

Frozen Food Locker Plants.- More than 10,000 frozen food locker plants were operating in the United States in January 1956. More than half of these were in towns having less than 2,000 population. Storage services and custom processing were the principal operations of most of these plants. But many sold frozen foods to retail customers, restaurants, hotels, retail food stores, and institutions. These plants process much of the frozen food they sell. But 54 percent of the locker plants in 1955 were selling frozen foods they bought from commercial packers. A growing number of

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11/ See Some Improved Methods of Handling Frozen Food in Wholesale Plants, by James A. Mixon and Theodore H. Allegri, U. S. Dept. Agr. Market. Res. Rept. 107, Nov. 1955.

12/ Quick Frozen Foods, XVIII: 8, March 1956, p. 60.

plants are distributors or subdistributors of commercially packed frozen foods. Some locker plants service frozen food plans. In 1954, locker plants custom processed 1.4 billion pounds of food and their sales of food and packaging materials amounted to 275 million dollars. Meat and poultry accounted for a large part of their sales. Locker plants generally sell to local consumers, stores, and institutions. Many of them process mainly locally produced products.

The total number of locker renters and home freezer owners served by locker plants has increased in recent years, although the number of plants has declined. Processing and merchandising of frozen foods have become more important functions and locker renting a less important source of revenue. The volume of frozen foods sold by locker plants is expected to increase. Locker plants provide products and services needed by owners of home freezers. Some locker plants in small towns make frozen food available to families who would not otherwise have a place to buy them. 13/

Frozen Food Plans.- Several years ago frozen food plans attracted much attention. Usually these plans were tied in with the sale of a home freezer. The purchaser was given the opportunity of buying frozen foods in "quantity lots" at prices which were sometimes less than regular prices in retail stores. Participants in some of these plans found them unsatisfactory. Although many plans soon folded up, a few had considerable growth. Locker-plant owners, food distributors, and others have organized and serviced new frozen food plans in recent years. Usually the distributors were those whose business was mainly with institutions and restaurants. Many of these newer plans do not involve the sale of a home freezer. Operators of these plans obtain customers who already own freezers.

One plan has granted franchises in many major cities throughout the country and advertises in nationally distributed publications. Another is reported to be servicing more than 3,000 families in Maine.

Other Outlets.- It is reported that some frozen food manufacturers and container firms believe that before many years vending machines will be widely used to distribute frozen foods. Among the reasons given for using vending machines are: (1) Need for more outlets for a growing output of frozen foods; (2) shortage of cabinet space in retail food stores; and (3) day-and-night, 7-day-a-week service, generally without waiting, provided by vending machines.

Brand Competition and Mergers

Nationally Advertised Brands Versus Private Labels.- Competition between frozen foods that bear a nationally advertised brand and those that have a private label has affected the structure of the frozen food

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13/ Data in this section were taken from Frozen Food Lockers: Highlights of a Survey, by P. C. Wilkins, L. B. Mann, and B. D. Miner, FCS Circular 17, U. S. Dept. of Agr., June 1956, and Frozen Food Locker Plants in the United States, Nineteenth Annual Count, January 1956, by L. B. Mann, FCS General Report 28, U. S. Dept. of Agr., August 1956.

industry and probably will continue to do so. Most retail stores carry brands of frozen foods that are nationally advertised by the packer or primary distributor. But many of the larger chain-store companies sell frozen foods that bear their own label or brand. Whoesale grocery companies that distribute frozen foods sometimes have private brands. Some of these wholesalers sponsor voluntary associations of independent retail food stores; others are cooperatively owned by independent retail food stores. These wholesalers perform the buying functions of retailers and help retailers through advertising and merchandising aids. Private brands are most common for frozen foods sold in large volume, such as frozen orange juice concentrate, peas, and lima beans.

The number of retail stores carrying private label frozen foods has grown in recent years, according to trade reports. Also, many stores, including those of some of the largest chains, have increased the number of products carried under private labels.

Generally, retail stores sell the private-label articles at lower prices than the nationally advertised articles, and in this way increase their sales of frozen foods. Moreover, they may obtain higher markups on private-label articles than on nationally advertised brands. Retailers place their private label articles where they are most likely to attract attention. In this way, and by advertising and other promotional schemes, they create consumer preference for frozen foods with their own labels.

More Packing for Private Labels.- As a result of the growth of private-label products in retail stores, more frozen food packers now than formerly are packing for private-label buyers. Chain-store companies and wholesalers usually buy the frozen foods which bear their label from independent packers. Private-label buyers provide a market for many of the smaller packers who would have difficulty marketing their output under their own brands.

The smaller packers are having more difficulty getting their products in the frozen food cabinets of retail stores because of the increase in the volume of frozen foods under private label and the limited cabinet space. Retailers have room for only the best known items -- those with nationally advertised brands -- in addition to their own private-label products. Increases in the cost of promoting a brand have made competition with nationally advertised brands harder for the smaller packers. Many small packers would prefer to have their own brand on their output. They dislike being wholly dependent on selling to private-label buyers or to sponsors of the nationally advertised brands who might decide to buy from other packers or do their own packing. Some independents have shown interest in group labeling, that is, use by a group of packers of the same label, which they would jointly advertise. Collective promotion would enable foods bearing their brand to compete successfully with nationally advertised products.

Vertical integration in the food industry has increased to some extent along with the growth in the use of private labels. Some of the chain-store companies and distributors have acquired packing facilities and are packing part of the products under their label.

Mergers.- Several well known frozen food packing companies have merged with other firms in recent years. A large baking company acquired one of the larger packers of frozen meat and fruit pies and other frozen products. A leading dairy company bought a company that processed frozen fruit and berry pies. A leading soup canning company acquired one of the better known packers of frozen poultry and frozen prepared foods. The company packing one of the most widely known brands of fruits and vegetables became the frozen food division of one of the leading canning companies. One of the principal packers of frozen concentrated orange juice merged with a larger firm that packed a full line of frozen fruits and vegetables.

Some of these mergers were motivated by a desire of outside companies to enter the frozen food packing industry because of the prospect of its growth. Many outside companies were processing food products that are somewhat related to the frozen food products acquired by the merger. Among other reasons, mergers were effected to extend product lines and to obtain nationally advertised brands.

Mergers among retail food-store companies in recent years have been one of the causes of the growth of private label frozen foods. Mergers have created new chain-store organizations of the size most likely to sponsor private labels. Some chains that consist of only a few stores have articles under their private labels, but companies with more stores -- the regional and national chains -- are likely to have a greater number of lines under private labels. Some of the larger chains have absorbed smaller chains and thus have increased the number of stores in which their private label articles are sold. According to Supermarket News, mergers and acquisitions by retail food-store chains affected 1,610 markets during 1955.

The Changing Wholesale and Retail Market

Retailing.- Present trends in retailing are favorable to expansion of frozen food markets. Retail stores are growing larger in size and becoming fewer in numbers. Large supermarkets, many of which were built in the last few years, now account for well over 50 percent of total food sales. Trade sources estimate about 70 percent of retail frozen food sales are made through supermarkets. The new supermarkets have much more frozen food cabinet space than the older stores. Capacity of these new stores to handle many more items will facilitate the introduction of new frozen food lines.

Wholesaling.- The increase in volume of frozen foods with private labels has limited the business available to many distributors. Retail-store firms buy private-label frozen foods directly from the packers. Many of the chain-store companies also buy nationally advertised products directly from packers or primary distributors and buy only the specialty and the slower moving frozen foods from distributors. Many distributors now perform only the warehouse and delivery functions for chain retail stores. But the larger chain-store companies often do their own warehousing and delivering. Distributors frequently sell mainly to restaurants and other institutional buyers.

More wholesale grocery companies in recent years have added frozen foods to their lines since these products have become a larger part of the sales of the stores they supply. Frozen foods, it is estimated, make up 5 or 6 percent of the total sales of the average grocery store. But in many stores they are a larger part of total sales. Prospects that sales of frozen foods will continue to grow at a faster rate than many grocery items encourage wholesalers to add frozen foods.

Prospects for Cost Reduction.- Prospects for reducing costs of frozen foods relative to costs of competing foods may be best in the distribution phase of the marketing process. Further reductions are anticipated in costs of delivering frozen foods from distributor's warehouses to retail stores. During delivery the temperature of the product must be kept at 0° F., except possibly for short intervals. This makes delivery a rather expensive operation. Moreover, costs often are high because quantities delivered are small and trips frequent. Many retail stores do not have any storage space for frozen foods except the display cabinet. In order to have room for a fairly wide assortment of frozen foods, only a small quantity of each can be kept in the cabinet. Distributors deliver less-than-case lots to these stores several times a week. Many stores have increased their storage space in recent years but many still cannot take full cases. Increases in cabinet space and back room freezer storage space are expected to make fewer less-than-case lot deliveries necessary. Such a development would reduce hauling cost and costs of assembling orders at the warehouse. Restaurants and other institutional buyers often lack adequate storage space to take case-lot deliveries.

What Growth of the Frozen Food Industry Means to Farmers

> The largest expansion of frozen foods has been in fruit and vegetable products. Current trends, however, indicate that future expansion of the frozen food industry may affect producers of other products. No generalization regarding the impact of the growth of frozen foods on farmers will apply equally to all producing areas or individual products. Freezing may increase the demand for some farm products at the expense of others. Shifts from fresh use to use of the product in frozen form may change competitive relationships between various areas producing a farm product. Frozen concentrated orange juice is an example of this. The value of the farm products in some frozen foods may be a small part of the retail price because so much of the processing is done in the factory rather than in the home. However, if the market for farm products is expanded by this additional processing, the farmers' returns may well be increased.

Demand for Farm Products

For products available seasonally in fresh form, year-round availability in frozen form is likely to increase total demand because of the lengthening of the marketing season. This is particularly likely to be true if the frozen product is a good "quality" substitute for the fresh product, and is relatively low priced in comparison with the canned or fresh product. Savings in shipping costs and reduction of waste and spoilage for many perishable products may offset any added processing costs. Convenience of the frozen product is another factor that is likely to increase demand for some farm products, perhaps at the expense of some that are less convenient.

For several commodities, such as oranges and strawberries, marketing the product in frozen form appears to have increased total demand. Year-round availability, relatively low prices, and convenience of use have all contributed to this increase. For some fruits and vegetables, per capita consumption (in all forms) has remained relatively stable or has increased at a slower rate than the frozen product. Thus, the increased demand for frozen products has resulted in a lower consumption rate of other forms. For some products these shifts to frozen use have been accompanied by a reduction in per capita consumption of the fresh product, with the canned product being affected in less degree.

Location of the Frozen Food Industry

Many more processing plants will have to be built if the output of frozen food grows as much as is expected. Of great importance to individual producers and competitive producing areas is the location of new plants. Presumably, the "best" location is one in which combined production and marketing costs are lowest. Generally, frozen food plants are located in or near the source of supply, mainly because of savings in transporatation from shipping the finished product, rather than the raw material.

To justify an investment in new frozen food plants a firm must be assured of a fairly regular and adequate supply of raw materials. This need favors the location of plants in areas in which the supply of raw materials is least likely to be curtailed or quality impaired by unexpected frosts, droughts, and other extreme variations in weather. Irrigated areas, for example, are more likely than others to have stability in production. Unit costs are likely to be lower in a plant that can operate for a long season by processing crops maturing at different times during the year. One reason many new plants for freezing strawberries have been built in California is that berries are available for processing for 6 months or more during the year.

The present geographical distribution of frozen fruits and vegetables illustrates the importance of availability of raw materials in determining location of plants. The Mountain and Pacific Coast States produce about two-fifths of the Nation's total tonnage of commercial vegetables and half the total fruit crop. These States produce about three-fifths of the frozen vegetables and a little more than a third of the combined pack of frozen fruits, berries, and fruit juices. Florida accounts for about four-fifths of the frozen citrus juices.

Prices and Returns to Farmers

In general, the increased use of frozen and other processed items would be expected to reduce short time price fluctuations associated with marketing many perishable products with seasonal production patterns. Some local producing areas that are able to market fresh products during periods in which supplies from principal producing areas are not available in the market may be affected by shifts from fresh use to frozen use. Growers within areas near new frozen food plants are, of course, most directly affected by the growth of the frozen food industry.

Packaged items are subject to product differentiation. Brand preferences may be developed by product promotion at the packer, wholesaler, or retail levels. These developments may affect the competitive situation facing the producer.

Additional services performed in marketing frozen foods, particularly prepared frozen foods, will likely reduce the farmer's share of the consumer's food dollar as compared with that for foods sold in fresh form. Retail prices of frozen foods are likely to be less variable than those of unprocessed foods and show less direct relation to changes in farm prices. A farmer's net income, however, is measured by his gross returns, less expenses, rather than by the share of the consumer's dollar which he receives. Thus, a decline in the farmer's share need not represent a proportionate drop in his income or profit position. For products for which an increased market is obtained through additional processing, it would be expected that the farmer's returns would be increased.